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EVALUATING THE PERFORMANCE DIAGNOSTIC CHECKLIST-HUMAN SERVICES TO ASSESS INCORRECT ERROR-CORRECTION PROCEDURES BY PRESCHOOL PARAPROFESSIONALS

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The Performance Diagnostic Checklist-Human Services (PDC-HS) has been used to assess variables contributing to undesirable staff performance. In this study, three preschool teachers completed the PDC-HS to identify the factors contributing to four paraprofessionals' inaccurate implementation of error-correction procedures during discrete trial training sessions. The PDC-HS indicated insufficient training as a contributing factor. We then implemented a nonindicated intervention (posting reminders), followed by an indicated intervention (behavioral skills training). The nonindicated intervention failed to produce desired performance improvements; however, the PDC-HS indicated intervention resulted in improvements for all paraprofessionals.

Key words: human services employees, performance assessment, performance management

Performance assessment is a behavior-analytic approach to evaluating staff performance problems, focusing on a systematic assessment of the relevant environmental variables impeding desired performance (Austin, 2000). Once the relevant variables are identified, that information can be used to design a function-based intervention to improve staff performance. The most commonly implemented informant-based performance assessment, the Performance Diagnostic Checklist (PDC; Austin, 2000), was adapted for application to human service settings (Carr, Wilder, Majdalany, Mathisen, & Strain, 2013). The Performance Diagnostic Checklist-Human Services (PDC-HS; Carr et al., 2013) identifies possible performance related factors across four main areas (training; task clarification and prompting; resources, materials, and processes; and performance consequences, effort, and competition) and nominates related evidence-based interventions.

Two studies have evaluated the utility of the PDC-HS in identifying relevant factors and nominating effective interventions in human service settings. Carr et al. (2013) implemented the PDC-HS to assess and address staff members' failure to correctly implement a cleaning protocol in a center-based autism treatment program. The results of the PDC-HS indicated possible factors related to insufficient training and performance feedback as contributing to the performance issues. Based on those results, and using the PDC-HS Intervention Planning section of the assessment, the researchers selected training and posted, graphed feedback as the indicated intervention package. A nonindicated intervention package, consisting of task clarification and more convenient placement of the materials necessary for task completion, was selected because the results of the PDC-HS did not indicate these factors as problematic. The nonindicated intervention was implemented for a subset of participants. The intervention indicated by the PDC-HS successfully improved the performance of 15 staff members across therapy rooms; however, the nonindicated

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intervention (implemented in two rooms) proved ineffective (Carr et al., 2013).

Ditzian, Wilder, King, and Tanz (2015) used the PDC-HS to assess poor staff performance related to securing therapy room doors in an autism treatment facility. The PDC-HS results indicated that the relevant factors impacting poor performance were related to performance consequences in the work place. Therefore, the researchers implemented a PDC-HS indicated intervention consisting of individual verbal and graphed feedback. As in Carr et al. (2013), the researchers implemented a nonindicated intervention for a subset of participants. The nonindicated intervention consisted of posting a written prompt posted outside the treatment rooms where the participants worked. The intervention indicated by the PDC-HS was successful at improving staff performance for all four participants, whereas the nonindicated intervention (implemented for two staff) was ineffective.

In Carr et al. (2013) and Ditzian et al. (2015), the settings were university-based treatment centers, and BCBA/BCBA-D-level supervisors completed the PDC-HS. Taken together, these two studies indicate that the PDC-HS may result in successful interventions to address staff performance issues when the assessment is completed by supervisors with explicit training in behavior analysis and professional credentials within the field from which the instrument was developed.

In this systematic replication, we evaluated the application of the PDC-HS by educators without professional credentials in behavior analysis, in a non-university-affiliated setting, and to a performance highly relevant to this setting. More specifically, special education preschool teachers applied the PDC-HS in public schools to evaluate factors related to paraprofessionals' incorrect implementation of error-correction procedures within discrete trial teaching (DTT). We also evaluated a nonindicated intervention for all of the participants, as opposed to a subset of participants. Finally, we assessed the acceptability of the PDC-HS by the special education preschool teachers.

METHOD

Setting, Participants, and Materials

This study took place in three early childhood special education classrooms providing educational services, including DTT, to three to eight students, aged 3 to 5. All sessions took place in an instructional cubby (approximately 1.5 m by 1.8 m) in the classrooms during the students' regularly scheduled DTT time. Participants completing the PDC-HS were three female special education teachers without professional credentials in behavior analysis, and who were not enrolled in training programs to obtain said credentials. Participants included in the treatment evaluation were four female paraprofessionals who were reported to have received initial DTT training from their supervising teachers at the start of the school year (approximately 4 months prior to the start of the study). The reported training included a single training session wherein the trainer verbally reviewed the steps involved in DTT and the paraprofessionals then observed another trained teacher or paraprofessional deliver DTT to a student on one occasion. The paraprofessional participants had been delivering DTT to students in the classroom for approximately 4 months to 2 years at the start of the study. Paraprofessionals were included if they scored 70% or below across three observations on a performance checklist of error-correction procedures during DTT. Similar to Ditzian et al. (2015), all paraprofessionals agreed to being observed, but were unaware of the specific purpose. Specifically, they were told that the research study focused on finding out more about a research tool designed to help supervisors improve employee performance, and that they would be observed during DTT instructional time at least two times a week during

unannounced visits. Following completion of the study, the paraprofessionals were debriefed on the specific purpose and outcomes, and were provided the opportunity to withdraw consent. This process was approved by the institution's review board.

Materials that were present for all sessions and conditions included students' programming binders, instructional materials, and putative reinforcers. Programming binders included a written protocol for each acquisition program that listed the correct discriminative stimulus to initiate a learning trial, a list of targets (mastered, in acquisition, and to be introduced), and data sheets. Only programs involving physical stimuli were selected for the study (e.g., match to sample, receptive prepositions, conditional discrimination), as they were most relevant to implementing the error-correction procedure. Paraprofessionals worked with the same students across all conditions of the study, and the programs selected and related stimuli remained the same for the duration of the study. Other study materials included the DTT error-correction checklist (available from the second author upon request), and the PDC-HS form.

Response Measurement and Interobserver Agreement

We measured correct or incorrect implementation of the error-correction procedure following a student's incorrect response during DTT sessions. Data were collected on the first five opportunities to implement the error-correction procedure within a DTT session. The percentage of steps correct per session was calculated by dividing the number of steps correct by the sum of the number of correct steps and the number of incorrect steps, and multiplying by 100. Observers collected data using a pencil and a paper checklist that included eight required components; these are listed in Table 1, along with operational definitions of the paraprofessional's responses.

A second trained observer independently collected data for 37% of baseline sessions, 56% of nonindicated intervention sessions, and 33% of indicated intervention sessions to assess interobserver agreement. An agreement was defined as both observers recording the same data for each step. Trial-by-trial interobserver agreement was calculated by dividing the number of trials with an agreement by the total number of trials in a session, multiplied by 100. Mean agreement was 95% (range, 93% - 100%) for Lisa, 95% (range, 93% - 96%) for Linda, 98% (range, 97% - 100%) for Carly, and 95% (range, 92% - 100%) for Paula.

We recorded data on the teacher's implementation of the nonindicated and indicated interventions using a procedural integrity checklist of the required steps. The steps for the nonindicated intervention included showing the posted document to the paraprofessional, taking the paraprofessional into the hallway, and reading the steps aloud. For the indicated intervention, we evaluated fidelity of providing instructions, modeling, rehearsing, and providing feedback as outlined in the procedures section. We calculated the teacher's percentage of steps implemented correctly in each BST training session by dividing the number of correctly implemented steps by the total number of steps and multiplying by 100%. Procedural integrity was 100% across all three teachers and interventions.

The social acceptability of the PDC-HS was assessed with the teachers who used it following the completion of the study. Teachers were provided with a paper questionnaire and asked to fill it out independently. The questionnaire was created by the experimenter and consisted of nine statements about perceptions of the PDC-HS (see Table 2). The rating scale included scores ranging 1 for strongly disagree to 5 for strongly agree.

Table 1
Operational Definitions of Paraprofessional Responses during Error Correction

Paraprofessional response	Definition
Block, remove materials, look down for 2 to 3 s	Paraprofessional physically blocks access to materials as soon as an incorrect response is emitted, removes materials from table, and turns head to left or right.
Record incorrect response	Paraprofessional records a "-" in the correct location on the data sheet.
Secure child's attention	Paraprofessional requires the child to look at the paraprofessional's face (acceptable prompts include providing an expectant gaze, touching the child's shoulder or jawline, or holding up the materials).
Re-present materials	Paraprofessional places the relevant stimuli on the table (no specific order required).
Re-present instruction and prompt	Paraprofessional presents instruction once, and immediately delivers prompt (last successful prompt from the session or from the previous session, based on data).
Give praise only	Paraprofessional delivers only vocal praise contingent on correct response (i.e., no tangibles or social games).
Record the response	Paraprofessional records the response obtained from the error correction trial in the correct location on the data sheet.
Brief inter-trial interval	Paraprofessional waits 3 to 5 s before presenting the next trial.

Design and Procedures

We implemented a concurrent-multiple-baseline-across-participants design. Sessions were conducted 1 to 2 times per day, 3 to 4 days per week.

We collected baseline data prior to the teacher completing the PDC-HS. All sessions began with the observer telling the paraprofessional that the observer would not be able to talk or answer questions during the observations, that the observer was not grading her performance, and that her position would not be impacted by the information collected during the observation. Paraprofessionals did occasionally attempt to talk to the observer or ask questions during baseline. Observers responded by reminding the paraprofessional that they could not speak to the paraprofessionals or answer questions during the observation and saying, "Keep going." No praise or corrective feedback was provided by observers to paraprofessionals during sessions in any condition. The observers did not intervene if problem behavior occurred.

To complete the PDH-HS, we provided the teacher a copy of the PDC-HS, read each item out loud, and recorded the teacher's answer. No other instructions or assistance were

Table 2
Summary of Social Validity Results for the Three Teachers

Questions	Strongly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Strongly Disagree
1. The PDC-HS was easy to use.		2	1		
2. I will use the PDC-HS in the future.	1	2			
3. Before using the PDC-HS I was confident in addressing staff performance problems.				2	1
4. After using the PDC-HS I am confident in addressing staff performance problems.	1	1	1		
5. The time requirements of using the PDC-HS are reasonable.		3			
6. The PDC-HS is easily incorporated into my performance evaluation systems.	1	1	1		
7. Overall, the PDC-HS is an effective tool to identify problems with and improve paraeducator's delivery of discrete trial instruction.	1	2			
8. I would recommend the PDC-HS to other educators.	1	1	1		
9. I am satisfied with the outcomes of using the PDC-HS.	1	2			

provided. Per the PDC-HS, teachers indicated "yes" or "no," and the experimenter filled in the corresponding "yes" or "no" bubble on the form. The PDC-HS is broken into four main subsections, (a) Training; (b) Task Clarification & Prompting; (c) Resources, Materials, & Processes; and (d) Performance Consequences, Effort, and Competition. Each section contains four to six questions related to task performance, for a total of 20 questions. Of the 20 questions, 17 are answered based on report from the individual familiar with the performance issues. The remaining seven questions require direct observation, as these questions require directly observing the performance, observing something about the environment, or obtaining a response from the performer. For example, question four in the training section requires observing if the performer can complete the target task at the required speed, if speed is a relevant dimension of correctly completing the task. Question two in the Training section requires the performer to vocally describe the specific task and when it should be completed. In the Task Clarification and Prompting section, question three requires that the individual completing the PDC-HS observe the work space to evaluate if a visual job aid is posted in the work area. For the seven questions requiring direct observation, both the relevant teacher and the experimenter conducted observations and independently scored the questions. Agreement was 100% for all seven questions on the first observation.

For the purpose of comparing the effects of a nonindicated and indicated intervention, a nonindicated intervention was selected and implemented first, followed by the indicated intervention. The teachers selected a nonindicated intervention from those not nominated by the PDC-HS as potential treatments, based on what the teacher felt could be reasonably implemented. Components of the PDC-HS with the highest percentage of questions answered with *no* were considered for the indicated intervention, and an intervention was selected that the teacher could reasonably implement. Both the nonindicated and indicated interventions targeted improving the correct implementation of the error-correction procedure.

Nonindicated intervention. The nonindicated intervention was implemented for all participants, as opposed to a subset of participants as was done in Carr et al. (2013) and Ditzian et al. (2015). The teachers selected task clarification and prompting as the nonindicated intervention, which included (a) posting the steps of the error-correction DTT procedure (with the highlighted definition of an error) in the instructional work station, and (b) the teacher providing a vocal prompt to the paraprofessionals that the document had been posted at the start of this condition. One teacher (and one paraprofessional, Carly) already had a written protocol describing error-correction steps during DTT posted on the wall of the work station before the study began (i.e. it was present during baseline). Therefore, the teachers decided to modify that protocol and post in all workstations.

The protocol consisted of a half sheet of colored construction paper with a white sheet pasted on top, with the title "Incorrect Response Procedures" typed in 16-point font. The steps written in the protocol were:

(1) End trial immediately (looking away, removing items from table)
(2) Take data (-)
(3) Give direction again
(4) Prompt (verbal, physical, model)
(5) Praise (not as exciting as an independent correct response)
(6) Take data (P or I)
(7) Check for independence (give direction)

The definition of an error ("wrong answer either verbally or pointing, needing to give direction more than once, giving any hints through body language [smiles, nodding head],

not touching the card correctly") was highlighted in yellow. At the bottom of the protocol, additional text stated "***Remember Transfer Trials!***." The written protocol was placed directly across the work table from the paraprofessional at seated eye-level and remained in place for the rest of the study (i.e., during nonindicated and indicated intervention conditions).

The vocal prompt occurred only once, before the first session in the nonindicated intervention condition. The teacher posted the written reminder on the work station wall before the paraprofessionals arrived to work. The teacher pointed to the posted document immediately prior to starting the session and told the paraprofessional that a new reminder was posted. The teacher then took the document off the wall and asked the paraprofessional to step into the hall. This was done to ensure that no other paraprofessionals in the study overheard the information. The teacher read the document to the paraprofessional and provided a vocal prompt to implement the error-correction procedures during the session. The teacher then replaced the document on the workstation wall.

PDC-HS indicated intervention. The assessment outcome identified an intervention in the area of "training" and specifically included providing BST on the implementation of the error-correction procedure. The other indicated intervention based on the outcome of the PDC-HS, "improved personnel selection," was not applicable. Although no specific training criteria were set for the teachers, the experimenter provided teachers with a brief vocal rationale of BST and described the steps, relative to the error-correction procedure. Specifically, the experimenter demonstrated how to explain, model, and role-play the error correction procedure, with the teacher playing the role of the paraprofessional during each demonstration. This took place once, and the experimenter answered any questions posed by the teacher. The BST intervention was delivered by the teacher once on the morning of the first indicated intervention session, approximately 30 min prior to the paraprofessionals implementing a DTT work session. The BST intervention took approximately 30 min to implement and included a written description of the procedure, explanation, modeling, and having the paraprofessionals practice (with feedback) with the teacher or another adult playing the part of the child. Mastery criterion during practice was demonstrating at least 90% correct implementation for five consecutive practice opportunities. All paraprofessionals met mastery criterion during BST.

RESULTS

Figure 1 depicts the results of the PDC-HS completed by the three teachers. All three teachers answered 100% of the questions in the "Training" section as indicative of a concern appropriate for intervention. Teachers 1, 2, and 3 endorsed 40%, 0%, and 20% of the questions in the "Task Clarification and Prompting" section, respectively (answered "no" indicating a possible relevant variable). For items in the "Resources, Materials, and Processes" section, Teachers 1 and 2 answered "no" to 0% of the questions, and Teacher 3 answered "no" to 30% of the questions. In the area of "Resources, Materials, and Processes," 40% of the questions indicated a problem based on answers from Teacher 1, and 80% of the questions suggested a concern based on answers from Teachers 2 and 3.

Figure 2 displays the results of the evaluation of the nonindicated and indicated intervention for all four paraprofessionals. Lisa correctly implemented 47% to 72% of the steps in the error-correction procedure during baseline. Lisa's responding in the nonindicated condition was initially at baseline levels, but increased in the second session of the nonindicated intervention before steadily decreasing to baseline levels. Following implementation of the

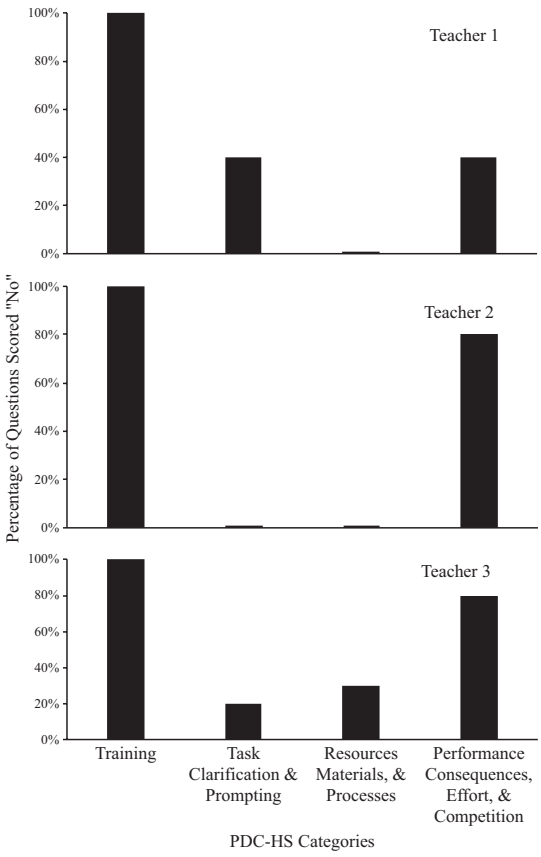

Figure 1. The percentage of questions in each section of the PDC-HS that teachers scored as "no."

indicated intervention condition, Lisa's responding immediately improved and she met the mastery criterion of at least 90% correct across three consecutive sessions.

During baseline, Linda's percentage of steps correct in the error-correction procedure ranged from 12% to 35% and remained in this range during the nonindicated intervention condition. In the indicated intervention condition, Linda's performance immediately increased and she met the mastery criterion.

Carly correctly completed 12% to 35% of error-correction steps in baseline. During the nonindicated intervention condition, her performance remained at, or close to, baseline levels. Although Carly's performance improved in the second session of this condition (82% correct), it quickly returned to, and remained at, baseline levels. Carly's performance immediately increased to criterion levels following implementation of the indicated intervention.

In baseline, Paula correctly implemented 10% to 32% of the error-correction steps. Paula's responding increased over baseline levels in the nonindicated intervention condition but did not meet the performance criterion. Following initiation of the indicated intervention condition, Paula's performance immediately increased, meeting the mastery criterion.

Across participants, there was no clear pattern of common errors during implementation of the error-correction procedure. Lisa did not consistently secure attending or provide a brief intertrial interval before the next learning trial during baseline and the nonindicated intervention. Her most common error during the indicated intervention was failing to deliver only praise during the error-correction steps. Linda never immediately blocked incorrect responses, ended the trial by removing materials, or re-presented materials during error-correction in baseline. Ensuring attending and re-presenting the instruction with a prompt were her most common errors during the nonindicated intervention. Ensuring attending and recording an incorrect response were her most common errors during the indicated intervention. Carly's most common errors in baseline were not recording data on the incorrect response and not securing the child's attention. During the nonindicated and indicated interventions, she continued to make errors with gaining the child's attention, as well as re-presenting the instruction with a prompt. In baseline, Paula did not block, remove materials, and look away, nor did she record data on the incorrect response or re-present the materials. During the nonindicated intervention, her most common errors were failing to secure the child's attention and not re-presenting the instruction with a prompt. Paula continued to make errors with

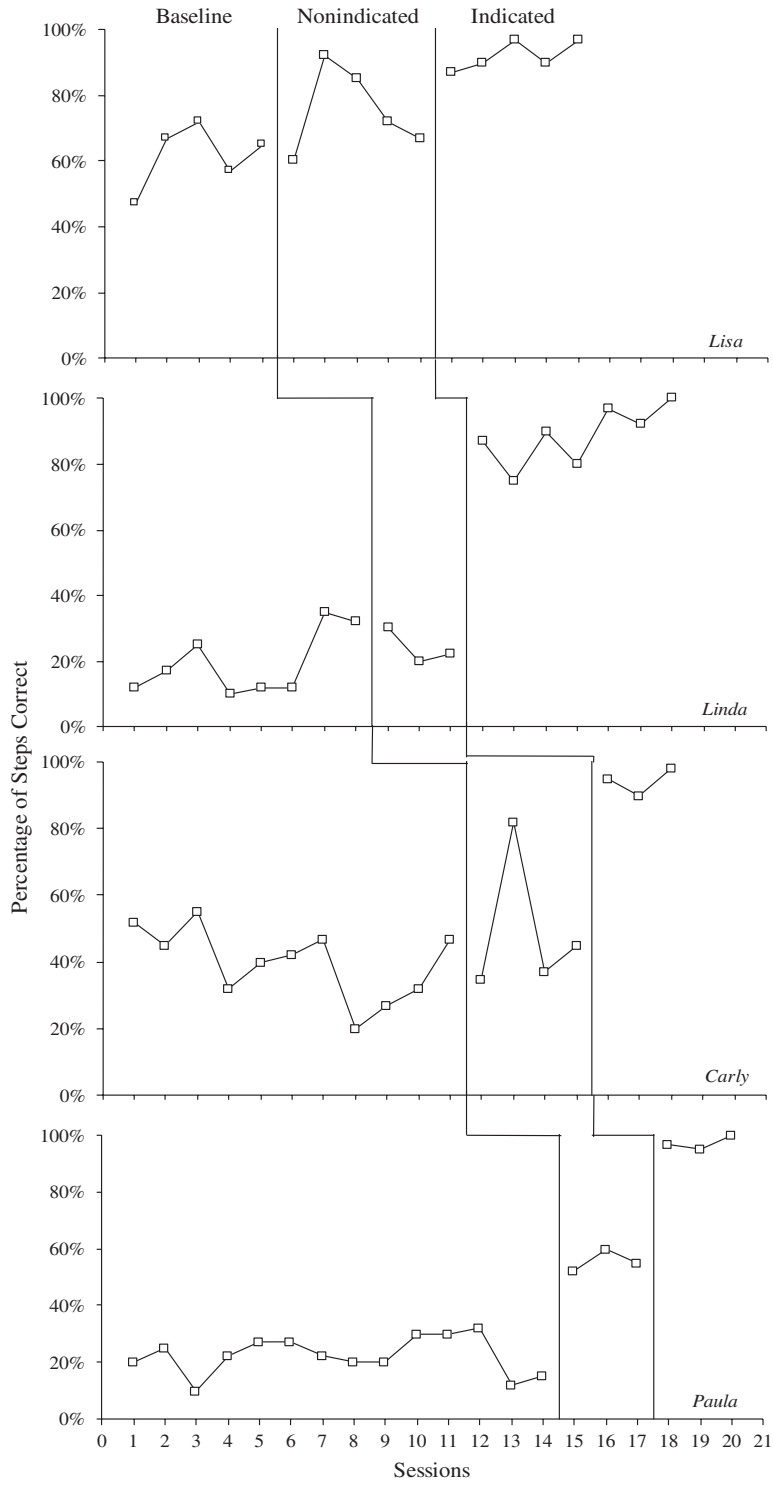

Figure 2. The percentage of error-correction procedure steps correct during baseline, nonindicated intervention, and PDC-HS indicated intervention.

re-presenting the instruction with a prompt during the indicated intervention.

The social validity measure indicated that teachers rated their experiences with the PDC-HS as positive, overall. Table 2 depicts the results across the three teachers for each of the nine social validity questions. Specifically, all three teachers indicated that they strongly or somewhat agreed that they would use the PDC-HS in the future, that it was effective, and that they were satisfied with the outcomes of using the PDC-HS.

DISCUSSION

Three public school early childhood special education teachers completed the PDC-HS to assess poor implementation of error-correction procedures by classroom paraprofessionals during DTT. The PDC-HS results suggested that insufficient training likely influenced performance problems. A nonindicated intervention produced some improvements in accurate implementation for two paraprofessionals and no clear improvements for the other two. The indicated intervention produced rapid improvements in accuracy, and all four paraprofessionals quickly met performance criterion.

The results of the current study replicate Carr et al. (2013) and Ditzian et al. (2015), indicating that the PDC-HS is a useful tool for assessing relevant factors related to performance issues and indicating effective interventions. The current study further extends the existing literature in several ways. First, the assessment was implemented by classroom teachers, rather than BCBA-level staff. Teachers and other clinicians who are not BCBAs frequently need to evaluate and address persistent performance issues with their staff; therefore, it is important to evaluate if the PDC-HS is an effective tool for those with less training in behavior analysis. The results of the present study indicate that classroom special education teachers can effectively use the PDC-HS; however, it is important to point out that this was with the support of an individual who was completing course work to obtain professional certification in behavior analysis and who was under the direct supervision of a BCBA-D.

Second, the assessment evaluated performance on a behavior that included more steps of intervention than those evaluated in previous studies (e.g., a cleaning task or securing a door). Staff in the human service field are often required to complete highly complex tasks that may have multiple steps and require the performer to make discriminations. This study extends the existing literature by demonstrating that the PDC-HS can be used to successfully assess and intervene on complex behavior. Third, the evaluation of the efficacy of a PDC-HS indicated and nonindicated intervention in this study enhances the results of previous studies in which interventions were compared for only a proportion of participants. Intervention comparisons across all participants strengthen the conclusions that can be drawn from the study regarding the validity of the PDC-HS outcomes. Finally, this study included a social validity measure to assess the acceptability of the PDC-HS and related intervention. Teachers, clinicians, and other practitioners may be more likely to use the PDC-HS if they find it acceptable, in terms of utility and time required to complete. The social validity data indicated that the teachers were generally satisfied with the PDC-HS assessment and resulting intervention.

As insufficient training was the most highly endorsed issue on the assessment, it is possible that no other intervention would have been successful until additional training was provided. However, all paraprofessionals had previously received training, and at least two of the participants correctly implemented 82%-92% of steps during at least one session following introduction of the nonindicated intervention. Because this study assessed the effects of only one indicated intervention, it is unknown if

other indicated interventions identified by the outcomes of the PDC-HS would have produced similar improvements in performance. It is possible that other interventions not endorsed by the PDC-HS, or that do not appear as recommended interventions in the intervention planning guide, could have been successful. However, in this and previous studies, the nonindicated interventions were ineffective at producing sufficient performance improvements for all participants.

It is also unclear if the paraprofessionals maintained performance improvements over time. Due to time constraints in the present study (the end of the school year), we were unable to implement maintenance checks to assess if the performance improvement maintained over longer periods. It is possible that the BST intervention provided to paraprofessionals will not result in sustained accurate performance. In addition, it is worth pointing out that variables in the "Performance Consequences, Effort, and Completion" section were highly endorsed by the majority of the teachers, but were not addressed in this investigation. It is possible that task performance was impacted by multiple factors. Perhaps in such a case, extended or multiple observations may be required to determine the extent to which designing an intervention based only on the highest ranked barrier would be effective. Future investigations might focus on exploring the degree to which obtained results from PDC-HS indicated interventions maintain over longer periods of time.

Another limitation of this study is that all of the participants received the same sequence of intervention. Therefore, it is unknown if exposure to the first condition (i.e., nonindicated intervention) influenced the efficacy of the indicated intervention. Because nonindicated interventions did not result in participants meeting the mastery criterion in this study or in previous studies, it is unlikely that preexposure to ineffective interventions influenced the efficacy of the subsequent indicated intervention. However, experimenters could evaluate the indicated intervention exclusively to determine whether its effects depend on a history with task clarification and prompting.

In this study, we did not collect data on student outcomes prior to and following improvements in implementation of the error-correction procedure. Therefore, it is unclear if the paraprofessional's performance improvements had any impact on the learners with whom they worked. However, experimenters have demonstrated that treatment integrity failures during DTT impede acquisition of the target skills (Carroll, Kodak, & Fisher, 2013; Reed, Reed, Baez, & Maguire, 2011). In future investigations, it may be useful to capture learner outcomes, such as frequency of problem behavior, number of errors, and number of mastered targets to identify the impact of intervention integrity on student behavior. This is particularly relevant to school and other applied clinical settings to determine if improving the fidelity of instruction has a direct and positive impact on learners.

Assuming use of the PDC-HS produces desired performance outcomes, it is possible that environmental variables could change, producing the same performance issues, but stemming from a cause other than the one identified in the original administration of the PDC-HS. If teachers are unable to remedy the performance issues using typical strategies, and the problems persist, it may be necessary to re-administer the PDC-HS to determine if different variables have become relevant, requiring a different intervention focus.

Future experimenters should continue to evaluate the effectiveness and applicability of the PDC-HS, as classroom teachers and other practitioners managing staff may benefit from using a structured assessment tool to assist in evaluating the factors related to performance problems, and to help guide them toward selecting a function-based intervention.

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